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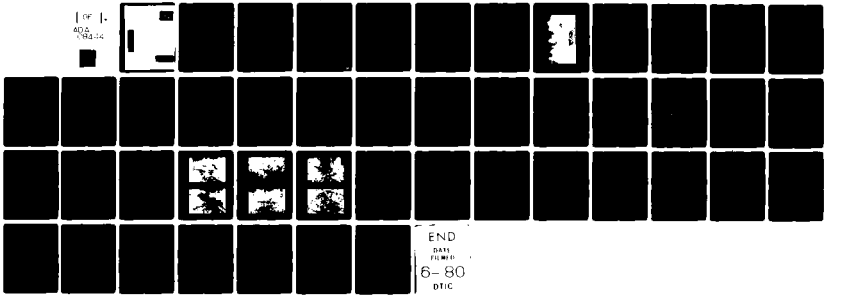

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20. Abstract

Pursuant to Public Law 92-367, Phase I Inspection Reports are prepared under guidance contained in the recommended guidelines for safety inspection of dams, published by the Office of Chief of Engineers, Washington, D. C. 20314. The purpose of a Phase I investigation is to identify expeditiously those dams which may pose hazards to human life or property. The assessment of the general conditions of the dam is based upon available data and visual inspections. Detailed investigations and analyses involving topographic mapping, subsurface investigations, testing, and detailed computational evaluations are beyond the scope of a Phase I investigation; however, the investigation is intended to identify any need for such studies.

Based upon the field conditions at the time of the field inspection and all available engineering data, the Phase I report addresses the hydraulic, hydrologic, geologic, geotechnic, and structural aspects of the dam. The engineering techniques employed give a reasonably accurate assessment of the conditions of the dam. It should be realized that certain engineering aspects cannot be fully analyzed during a Phase I inspection. Assessment and remedial measures in the report include the requirements of additional indepth study when necessary.

Phase I reports include project information of the dam and appurtenances, all existing engineering data, operational procedures, hydraulic/hydrologic data of the watershed, dam stability, visual inspection report and an assessment including required remedial measures.

PREFACE

This report is prepared under guidance contained in the Recommended Guidelines for Safety Inspection of Dams, for Phase I Investigations. Copies of these guidelines may be obtained from the Office of the Chief of Engineers, Washington, D.C. 20314. The purpose of a Phase I investigation is to identify expeditiously those dams which may pose hazards to human life or property. The assessment of the general condition of the dam is based upon available data and visual inspections. Detailed investigation and analyses involving topographic mapping, subsurface investigations testing, and detailed computational evaluations are beyond the scope of a Phase I investigation; however, the investigation is intended to identify any need for such studies.

In reviewing this report, it should be realized that the reported condition of the dam is based on observations of field conditions at the time of inspection along with data available to the inspection team. In cases where the reservoir was lowered or drained prior to inspection, such action, while improving the stability and safety of the dam, removes the normal load on the structure and may obscure certain conditions which might otherwise be detectable if inspected under the normal operating environment of the structure.

It is important to note that the condition of a dam depends on numerous and constantly changing internal and external conditions, and is evolutionary in nature. It would be incorrect to assume that the present condition of the dam will continue to represent the condition of the dam at some point in the future. Only through continued care and inspection can there be any chance that unsafe conditions be detected.

Phase I inspections are not intended to provide detailed hydrologic and hydraulic analyses. In accordance with the established guidelines, the spillway design flood is based on the estimated "Probable Maximum Flood" for the region (flood discharges that may be expected from the most severe combination of critical meteorologic and hydrologic conditions that are reasonably possible), or fractions thereof. Because of the magnitude and rarity of such a storm event, a finding that a spillway will not pass the design flood should not be interpreted as necessarily posing a highly inadequate condition. The design flood provides a measure of relative spillway capacity and serves as an aid in determining the need for more detailed hydrologic and hydraulic studies, considering the size of the dam, its general condition, and the downstream damage potential.

PHASE I INSPECTION REPORT
NATIONAL DAM SAFETY PROGRAM

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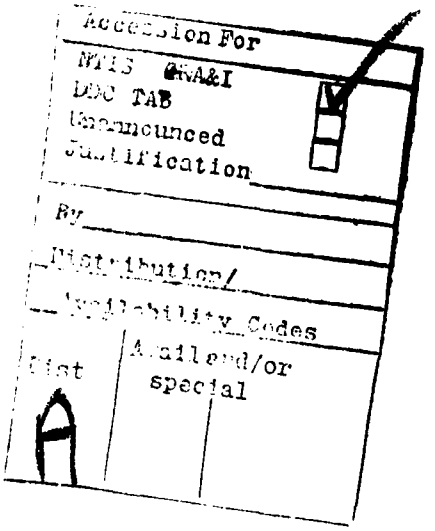

PHASE I INSPECTION REPORT
NATIONAL DAM SAFETY PROGRAM

Name of Dam: Birdwood Dam
State: Virginia
County: Albemarle
USGS 7.5 Minute Quadrangle: Charlottesville West, VA
Stream: Morey Creek
Date of Inspection: 13 November 1979

BRIEF ASSESSMENT OF DAM

Birdwood Dam is an earthfill dam approximately 270 feet long and 26 feet high, with a 70 foot wide, irregularly shaped, earthen emergency spillway. The dam is owned by the University of Virginia. The dam, located approximately 1.1 miles west of Charlottesville, Virginia, is used for agricultural water supply. Birdwood Dam is a "small" size - "high" hazard structure as defined by the Recommended Guidelines for Safety Inspection of Dams. Visual inspection and office analyses indicate deficiencies requiring immediate attention.

Using the Corps of Engineers' screening criteria for initial review of spillway adequacy, the 1/2 Probable Maximum Flood (1/2 PMF) was selected as the spillway design flood (SDF). The SDF was routed through the reservoir and found to overtop the dam by a maximum depth of 1.6 feet with an average critical velocity of 5.9 f.p.s. Total duration of dam overtopping would be approximately 1.1 hours. The spillway is capable of passing only 50 percent of the SDF or 25 percent of the Probable Maximum Flood (PMF).

The dam and appurtenant structures were found to be in generally poor overall condition. According to Bureau of Reclamation standards, the embankment width and downstream slope are considered inadequate. The embankment is heavily overgrown with trees and brush, major erosion has occurred in the emergency spillway, there are several areas of seepage along the toe of the embankment, and there are no facilities for drawdown of the reservoir. There is no trash rack on the principal spillway intake, the principal spillway conduit is leaking near the outlet, and there is an animal burrow in the crest of the dam.

Due to the poor condition of the spillway and the probability of dam failure in the event of overtopping, the spillway is adjudged as seriously inadequate and the dam is classified as unsafe, non-emergency.

The following remedial measures should be undertaken immediately: the reservoir should be at least partially drained, a professional consultant should be engaged to determine spillway adequacy and dam stability, excess vegetation should be removed to the degree recommended by the professional consultant, the seeps should be checked regularly for turbidity or increase in flow, and a warning system and emergency action plan should be developed and implemented.

The following should be accomplished as part of the general maintenance of the dam: repair the animal burrow on the dam crest, install a trash rack on the principal spillway intake, install a staff gage, and cut the vegetation on the dam regularly.

Since the inspection was conducted, the owner has drained the reservoir. The principal spillway was broken off at the bottom of the riser and the embankment has been breached.

MICHAEL BAKER, JR., INC.

Michael Baker, III, P.E.
Chairman of the Board and
Chief Executive Officer

COMMONWEALTH OF VIRGINIA
MICHAEL
BAKER III
NO. 3176
CERTIFIED PROFESSIONAL ENGINEER

SUBMITTED: Original signed by JAMES A. WALSH

James A. Walsh, P.E.
Chief, Design Branch

RECOMMENDED: Original Signed by: Ronald G. Vann
for Jack G. Starr, P.E.
Chief, Engineering

APPROVED: Original signed by: Douglas L. Haller

Douglas L. Haller
Colonel, Corps of Engineers
District Engineer

Date: MAR 14 1980

OVERALL VIEW OF DAM

PHASE I INSPECTION REPORT
NATIONAL DAM SAFETY PROGRAM
NAME OF DAM: BIRDWOOD DAM ID# VA 00344

SECTION 1 - PROJECT INFORMATION

1.1 General

1.1.1 Authority: Public Law 92-367, 8 August 1972, authorized the Secretary of the Army, through the Corps of Engineers, to initiate a national program of safety inspections of dams throughout the United States. The Norfolk District has been assigned the responsibility of supervising the inspection of dams in the Commonwealth of Virginia.

1.1.2 Purpose of Inspection: The purpose is to conduct a Phase I inspection according to the Recommended Guidelines for Safety Inspection of Dams. The main responsibility is to expeditiously identify those dams which may be a potential hazard to human life or property.

1.2 Description of Project

1.2.1 Description of Dam and Appurtenances: Birdwood Dam is an earthfill embankment approximately 26 feet high[1] and 270 feet long. The upstream and downstream embankment slopes are approximately 3H:1V (Horizontal to Vertical) and 2H:1V respectively. The crest of the dam is approximately 10 feet wide and has a minimum elevation of 501.5 feet Mean Sea Level (M.S.L.)[2] at a point adjacent to the emergency spillway.

The principal spillway, located approximately at the dam centerline, is a 6 inch vertical cast-iron pipe at elevation 496.7 feet M.S.L. with no trash rack. The principal spillway exits at elevation 479.7 feet M.S.L. into the downstream channel at the toe.

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[1]Measured from the bottom of the cut-off trench to the embankment crest.
[2]All elevations are approximately Mean Sea Level as approximated by interpolation from USGS Quandrangle.

The emergency spillway, located in the left[3] abutment, is an earth spillway approximately 70 feet wide. The spillway has eroded to bedrock in places and migrated from its original channel. The invert elevation of the control section is 497.3 feet M.S.L. There are no facilities for dewatering the reservoir.

1.2.2 Location: Birdwood Dam is located on Morey Creek approximately 2.2 miles upstream from Moores Creek, a tributary to the Rivanna River, in Albemarle County, Virginia. The dam is situated on the University of Virginia property approximately 1.1 miles west of the Charlottesville, Virginia, city limits. Access to the dam is obtained via a private road located on U.S. Route 250 0.3 mile west of the junction of U.S. Route 29 Bypass and U.S. Route 250. A Location Plan is included with this report.

1.2.3 Size Classification: The maximum height of the dam is 22 feet; the reservoir storage capacity to the crest of the dam, elevation 501.5 feet M.S.L., is 46 acre-feet. Therefore, the dam is in the "small" size category as defined by the Recommended Guidelines for Safety Inspection of Dams.

1.2.4 Hazard Classification: Within 700 feet downstream of Birdwood Dam along the outlet channel are two residential structures. Loss of human life is highly probable in the event of dam failure by overtopping. For this reason, Birdwood Dam is classified in the "high" hazard category according to the Recommended Guidelines for Safety Inspection of Dams. The hazard classification used to categorize dams is a function of location only and has nothing to do with its stability or probability of failure.

1.2.5 Ownership: The dam is owned by the University of Virginia, located in Charlottesville, Virginia.

1.2.6 Purpose of Dam: The reservoir was originally constructed for agricultural water supply; however, it is no longer used extensively for that or any other specific purpose.

[3]Facing downstream.

1.2.7 Design and Construction History: Design records do not exist for the dam; however, the dam was constructed under the supervision of Mr. R.O. Anderson who was the farm manager at the time. According to Mr. Anderson, Moore, Kelly and Reddish, of Orange, Virginia, conducted the earth moving activities in the early 1930's. This company is still in operation in a descendent firm, Moore Golf, Inc., Culpepper, Virginia.

1.2.8 Normal Operational Procedures: This reservoir is normally operated at the level of the principal spillway, elevation 496.7 feet M.S.L. No formal operating procedures are followed for this structure. See Paragraph 4.1 for detailed operating procedures.

1.3 Pertinent Data

1.3.1 Drainage Area: The drainage area tributary to the dam is 0.47 square mile.

1.3.2 Discharge of Dam Site: The maximum discharge from the reservoir is unknown.

Principal Spillway:
Pool level at top of dam . . . . 2 c.f.s.

Emergency Spillway:
Pool level at top of dam . . . . 980 c.f.s.

1.3.3 Dam and Reservoir Data: Pertinent data on the dam and reservoir are shown in the following table:

TABLE 1.1 DAM AND RESERVOIR DATA

Item	Elevation feet M.S.L.	Reservoir Capacity: Area acres	Reservoir Capacity: Acre-feet	Reservoir Capacity: Watershed inches	Length feet
Top of dam	501.5	6.6	46	1.8	1400
Emergency spillway invert	497.3	5.0	22	0.9	1270
Principal spillway crest (normal pool)	496.7	4.8	19	0.8	1260
Streambed at downstream toe of dam	478.8	-	-	-	-

SECTION 2 - ENGINEERING DATA

2.1 Design: There were no design reports available for preparation of this report; however, phone contact was made with R.O. Anderson of Charlottesville, Virginia, the Birdwood Farm Manager who overviewed the construction of the dam in the early 1930's. According to Mr. Anderson, there is no core wall within the dam; however, there is a cut-off trench 3 to 4 feet below the normal ground elevation. The design did not include any toe drains.

2.2 Construction: There were no pre-construction or as-built plans available for review. R.O. Anderson stated that the dam was constructed by Moore, Kelly and Reddish, of Orange, Virginia. He recalled that the dam was built in the early 1930's.

2.3 Evaluation: No design drawings or construction records were available for review. Evaluations contained in this report are based primarily on field observations, measurements taken during the inspection, and interviews with University of Virginia personnel. No assessment of the engineering was possible due to lack of design data.

SECTION 3 - VISUAL INSPECTION

3.1 Findings

3.1.1 General: The field inspection was conducted on 13 November 1979. Skies were overcast and rain persisted throughout the day. The recorded temperature was 45°F and ground conditions were damp due to the rain. At the time of the inspection, the pool elevation was 496.9 feet M.S.L. and the tailwater elevation was 478.8 feet M.S.L. No record was found of any previous inspections. The embankment and appurtenant structures were found to be in poor condition at the time of inspection. The following are brief summaries of deficiencies found during the inspection. A Field Sketch of conditions is shown as Plate 1. The complete visual inspection check list may be found in Appendix III.

3.1.2 Dam: The upstream and downstream embankments, crest, and abutments were extremely overgrown with trees and brush (see Overall View of Dam). Surface cracks were not observed; however, some sloughing was apparent midway up and on the left side of the downstream embankment. The entire embankment was damp, particularly on the left side junction of embankment and abutment, where a small marsh exists. Inspection team members were able to sink a rod 1 to 1.5 feet deep into this area. The right junction was also damp. The downstream embankment surface seemed somewhat irregular; however, vegetation prevented a better assessment. Noticeable seepage was found along the toe of the dam resulting in marshy areas (see Photos 5 and 6). Flows were less than one gallon per minute each. The junction between the spillway and dam showed signs of erosion. The upstream embankment had riprap lower than the water level. There is an animal burrow on the crest of the dam.

3.1.3 Appurtenant Structures: The approach and discharge channel of the emergency spillway are severely eroded to the underlying bedrock. The discharge channel has migrated to the left of the intended channel and has allowed erosion to depths of ten feet and more to occur.

The principal spillway is a 6 inch cast-iron pipe. The inlet was submerged at the time of inspection; however, it is apparently vertical and has no trash rack. The outlet protrudes from the downstream face of the dam and has several small holes in the bottom of the pipe near the downstream end. The outlet channel itself is clear; however, heavy brush and trees vegetate the overbanks, extending up to the channel banks. There is no emergency drawdown facility.

3.1.4 Reservoir Area: The surrounding hillsides are gradually sloped and well vegetated. The upstream embankment has riprap below the present water level. There was no sedimentation observed. Three small reservoirs are located upstream.

3.1.5 Downstream Channels: The channel itself is clear; however, the vegetation of the overbanks is very heavy and consists of trees and heavy brush. There are two residences 700 feet downstream.

3.2 Evaluation: Due to the location of the two residences downstream, there is concern for the stability of the dam. The seepage areas and marshy grounds should be further investigated and continually monitored for turbidity and/or increase in flow which would indicate the potential for piping of embankment material. The reservoir level should be drawn down and a trash rack placed on the principal spillway. The leak in the principal spillway conduit should be repaired.

The emergency spillway should be regraded and seeded. Excess vegetation located on the dam, around the principal spillway outlet, and within the downstream channel should be removed and the embankment and toe areas should be reinspected after removal of the excess vegetation. A staff gage should be installed to monitor reservoir levels above normal pool.

SECTION 4 - OPERATIONAL PROCEDURES

4.1 Procedures: Operation of the dam is an automatic function maintained by the principal spillway and the emergency spillway. Water entering the reservoir flows into the principal spillway at elevation 496.7 feet M.S.L. When the inflow is sufficient the reservoir level rises above elevation 497.3 feet M.S.L. and discharges through the emergency spillway.

4.2 Maintenance of Dam: Maintenance of the dam is the responsibility of the owner. An inspection or maintenance schedule has not been instituted.

4.3 Maintenance of Operating Facilities: There are no facilities requiring operation at the dam.

4.4 Warning Systems: At the present time, there is no warning system or evacuation plan in operation.

4.5 Evaluation: Maintenance of the dam in the past has been inadequate and must be improved. An annual inspection and maintenance program should be implemented.

Since there are two homes in the downstream damage area, a warning system and emergency action plan should be developed and implemented.

SECTION 5 - HYDRAULIC/HYDROLOGIC DATA

5.1 Design: No design data were available for use in preparing this report.

5.2 Hydrologic Records: No rainfall or stream flow records were available at the dam site.

5.3 Flood Experience: There were no high water marks or other information about past floods available at the dam site.

5.4 Flood Potential: The Probable Maximum Flood (PMF), 1/2 Probable Maximum Flood (1/2 PMF), and the 100-year flood were developed and routed through the reservoir by use of the HEC-1 DB computer program (Reference 9, Appendix V) and appropriate unit hydrographs, precipitation, and storage-outflow data. Clark's T_c and R coefficients for the local drainage areas were estimated from basin characteristics. The rainfall applied to the unit hydrograph was taken from publications by the U.S. Weather Bureau and the National Oceanic and Atmospheric Administration (References 16 and 17, Appendix V). Rainfall losses for the 100-year flood were estimated at an initial loss of 1.5 inches and a constant loss thereafter of 0.15 inch per hour. An initial loss of 1.0 inch and a loss rate of 0.05 inch per hour were used for the PMF and 1/2 PMF.

5.5 Reservoir Regulation: Pertinent dam and reservoir data are shown in Table 1.1, Paragraph 1.3.3.

Regulation of flow from the reservoir is automatic. Normal flows are maintained by the crest of the riser with an elevation of 496.7 feet M.S.L. Water also flows past the dam through the ungated, vegetated emergency spillway in the event water in the reservoir rises above an elevation of 497.3 feet M.S.L.

Outlet discharge capacity was computed by hand; reservoir area was planimetered from the Charlottesville West, Virginia, 7.5 minute USGS quadrangle; and storage capacity was computed directly by the HEC-1 program. All flood routings were begun with the reservoir at normal pool.

5.6 Overtopping Potential: The probable rise of the reservoir and other pertinent information on reservoir performance are shown in the following table:

TABLE 5.1 RESERVOIR PERFORMANCE

Item	Normal(a)	Hydrographs: 100-year flood	Hydrographs: 1/2 PMF	Hydrographs: PMF(b)
Peak flow, c.f.s.				
Inflow	1	700	2508	5597
Outflow	1	633	2508	5543
Peak elev., ft. M.S.L.	496.9	500.7	503.2	504.2
Emergency spillway (c) (elev. 497.3 ft. M.S.L.)				
Depth of flow, ft.	-	3.4	5.9	6.9
Average velocity, f.p.s.	-	8.5	12.2	13.7
Duration of flow, hrs.	-	16.9	24.3	26.2
Non-overflow section (c) (elev. 501.5 ft. M.S.L.)				
Depth of flow, ft.	-	-	1.6	2.7
Average velocity, f.p.s.	-	-	5.9	7.6
Total duration of overtopping hrs.	-	-	1.1	2.7
Tailwater elev., ft. M.S.L.	478.8	-	-	-

(a) Conditions at time of inspection.
(b) The PMF is an estimate of flood discharges that may be expected from the most severe combination of critical meteorologic and hydrologic conditions that are reasonably possible in the region.
(c) Depth and velocity estimates were based on critical depth at control section.

5.7 Reservoir Emptying Potential: There are no facilities for dewatering the reservoir.

5.8 Evaluation: Birdwood Dam is a "small" size - "high" hazard dam requiring evaluation for a spillway design flood (SDF) of a magnitude between that of the 1/2 PMF and PMF, inclusive. Since there are only two homes in the downstream damage reach, the 1/2 PMF was selected as the SDF. The 1/2 PMF was routed through the reservoir and found to overtop the dam by a maximum depth of approximately 1.6 feet, with an average critical velocity of 5.9 f.p.s. Total duration of dam overtopping would be approximately 1.1 hours. The spillway is capable of passing only 25 percent of the PMF.

Conclusions pertain to present day conditions and the effect of future development on the hydrology has not been considered.

SECTION 6 - DAM STABILITY

6.1 Foundation and Abutments: There is no information available on the foundation conditions. The dam is in the Piedmont physiographic province of Virginia. According to Mr. R. O. Anderson, who overviewed the construction, there is a cut-off trench 3 to 4 feet below the normal ground elevation, but there is no foundation drain. As noted in the visual inspection: some sloughing was apparent on the downstream embankment; there was a very wet, marshy area at the junction of the downstream embankment and the left abutment; the downstream embankment surface seemed somewhat irregular; and noticeable seepage was found along the toe of the dam.

6.2 Embankment

6.2.1 Materials: There is no information available on the nature of the embankment materials. The area soils are generally low-plastic clays and silts.

6.2.2 Stability: There are no available stability calculations. The dam is 26 feet high and 10 feet wide. It has an estimated upstream slope of 3H:1V and a measured downstream slope of 2H:1V. The dam exists at normal storage pool. It is not known whether the dam was ever subjected to a maximum storage pool. The dam has a freeboard of approximately 0.6 foot from maximum control storage. There are no facilities for dewatering the reservoir, so the embankment is not subjected to a drawdown.

According to guidelines presented in Design of Small Dams by the U.S. Department of the Interior, Bureau of Reclamation, for small homogeneous dams, with a stable foundation, not subject to a drawdown, and composed of low-plastic clays and silts (CL, ML); the recommended slopes are 3H:1V upstream and 2.5H:1V downstream. The recommended width is 15 feet. Based on these guidelines, the upstream slope is considered to be adequate; however, the downstream slope and width are considered to be inadequate.

6.2.3 Seismic Stability: The dam is located in Seismic Zone 2. Therefore, according to the Recommended Guidelines for Safety Inspection of Dams, the dam is considered to have no hazard from earthquakes provided static stability conditions are satisfactory and conventional safety margins exist.

6.3 Evaluation: There is insufficient information to adequately assess the stability of the dam. However, the visual inspection revealed severe seepage problems. Also, based on the Bureau of Reclamation guidelines, the width and downstream slope are inadequate. Also, the spillway is incapable of passing the design flood and overtopping flows are considered detrimental to the embankment. Overtopping flows are shallow and only last 1.1 hours, but the velocity approaches 6 f.p.s., the effective eroding velocity for a vegetated earth embankment. Based on these conditions, the embankment is considered not sound and the services of a qualified geotechnical engineering firm should be retained to perform a stability check of the dam. It is recommended that the reservoir be at least partially drained to alleviate the seepage pressure.

SECTION 7 - ASSESSMENT/REMEDIAL MEASURES

7.1 Dam Assessment: The dam and appurtenant structures are generally in poor overall condition. Based on the Bureau of Reclamation guidelines, the width and downstream slope of the embankment are considered inadequate. There are several areas of seepage along the toe of the dam. The worst area is located along the contact between the left abutment and the downstream embankment; the entire left abutment contact area was wet and soft. Members of the inspection team were able to push a survey leveling rod into the soil to a depth of 1 to 1.5 feet in this area. The emergency spillway has eroded to bedrock and has migrated out of its original channel. There is an animal burrow on the crest of the dam. There is no trash rack on the principal spillway intake and the principal spillway conduit is leaking near its outlet. There are no facilities for dewatering the reservoir. The entire embankment is heavily overgrown with trees and brush.

Using the Corps of Engineers' screening criteria for initial review of spillway adequacy, the 1/2 PMF was selected as the SDF for the "small" size - "high" hazard classification of Birdwood Dam. It has been determined that the dam would be overtopped by the SDF by a maximum depth of 1.6 feet with an average critical velocity of 5.9 f.p.s. and that total duration of dam overtopping would be 1.1 hours. The spillway is capable of passing only 50 percent of the SDF or 25 percent of the PMF.

Due to the poor condition of the embankment and the probability of dam failure in the event of overtopping, the spillway is adjudged as seriously inadequate and the dam is classified as unsafe, non-emergency.

The recommended remedial measures are considered urgent and, therefore, should be accomplished immediately.

7.2 Recommended Remedial Measures: It is recommended that the following repair items be undertaken immediately:

The reservoir should be at least partially drained to alleviate the seepage pressure. The owner should engage the services of a professional consultant to determine by more sophisticated methods and procedures the adequacy of the spillway and the stability of the embankment. The owner should periodically check and record the amount of flow from the seeps along the toe. Also, seepage should be checked for turbidity. Increased

flow and/or turbidity may indicate the potential for piping of embankment material.

The recommendations of the consultant should include measures required to improve the stability of the embankment, to increase the spillway capacity and to provide erosion protection in the spillway, and to repair the leak in the principal spillway conduit. The consultant should also make recommendations as to the extent of tree and brush removal from the dam.

The owner should develop and implement a warning system and emergency action plan. Until corrective measures are completed, the dam should be checked during periods of heavy run-off. If evidence of piping of embankment material is detected or if dam overtopping is imminent, warning should be issued to the downstream inhabitants.

The following items should be accomplished as part of the general maintenance of the dam:

1) Excavate, fill, compact, and seed the animal burrow on the crest of the dam.

2) Install a trash rack on the principal spillway intake.

3) Install a staff gage to monitor reservoir levels above normal pool.

4) After the trees and brush have been removed from the dam, cut the vegetation on the dam regularly.

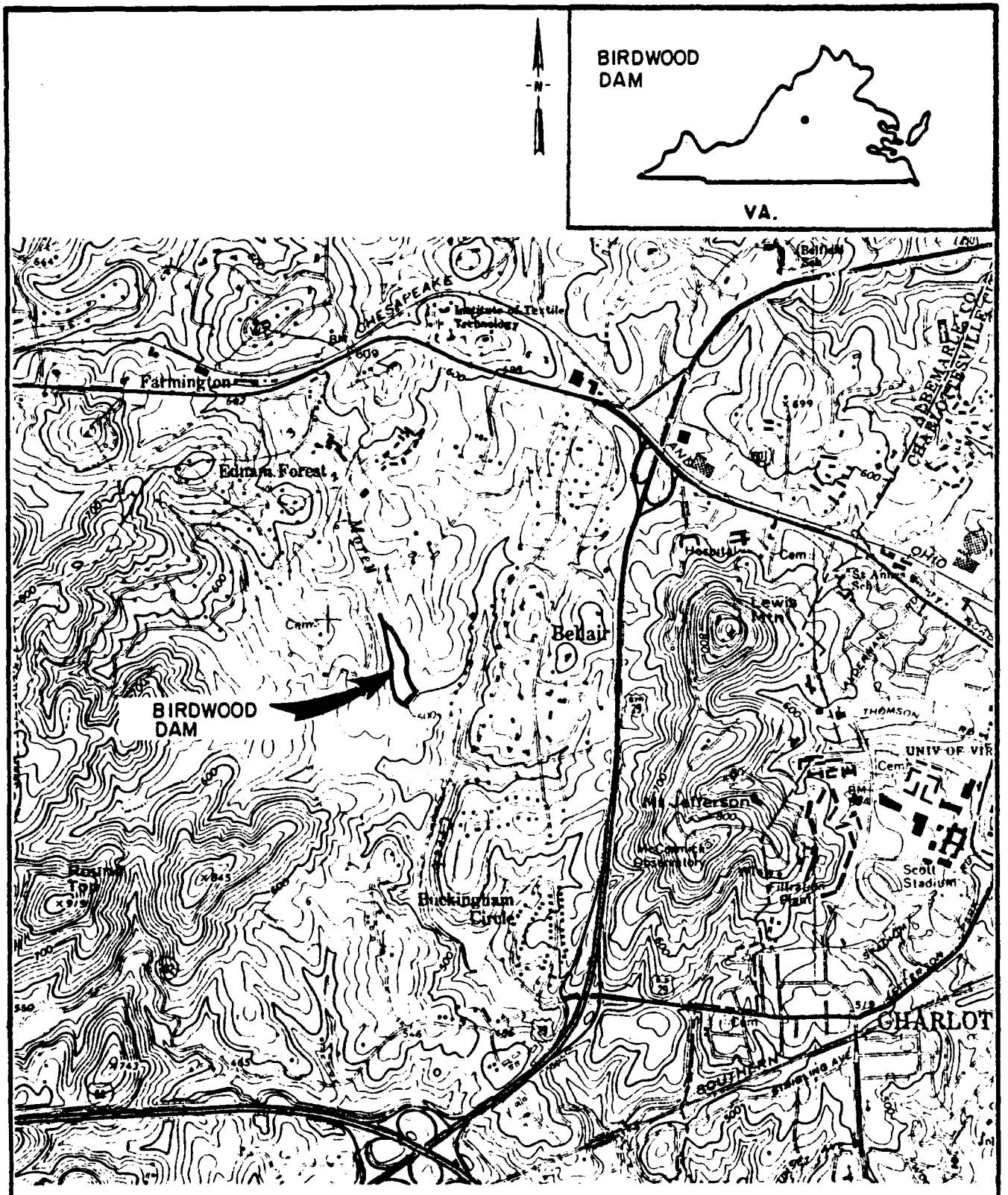
7.3 Remedial Measures Taken: Since the inspection, the reservoir has been drained; the principal spillway was broken off at the bottom of the riser and the dam has been breached. A copy of the letter advising the Virginia State Water Control Board that the reservoir was being drained is included in Appendix IV.

APPENDIX I

PLATES

CONTENTS

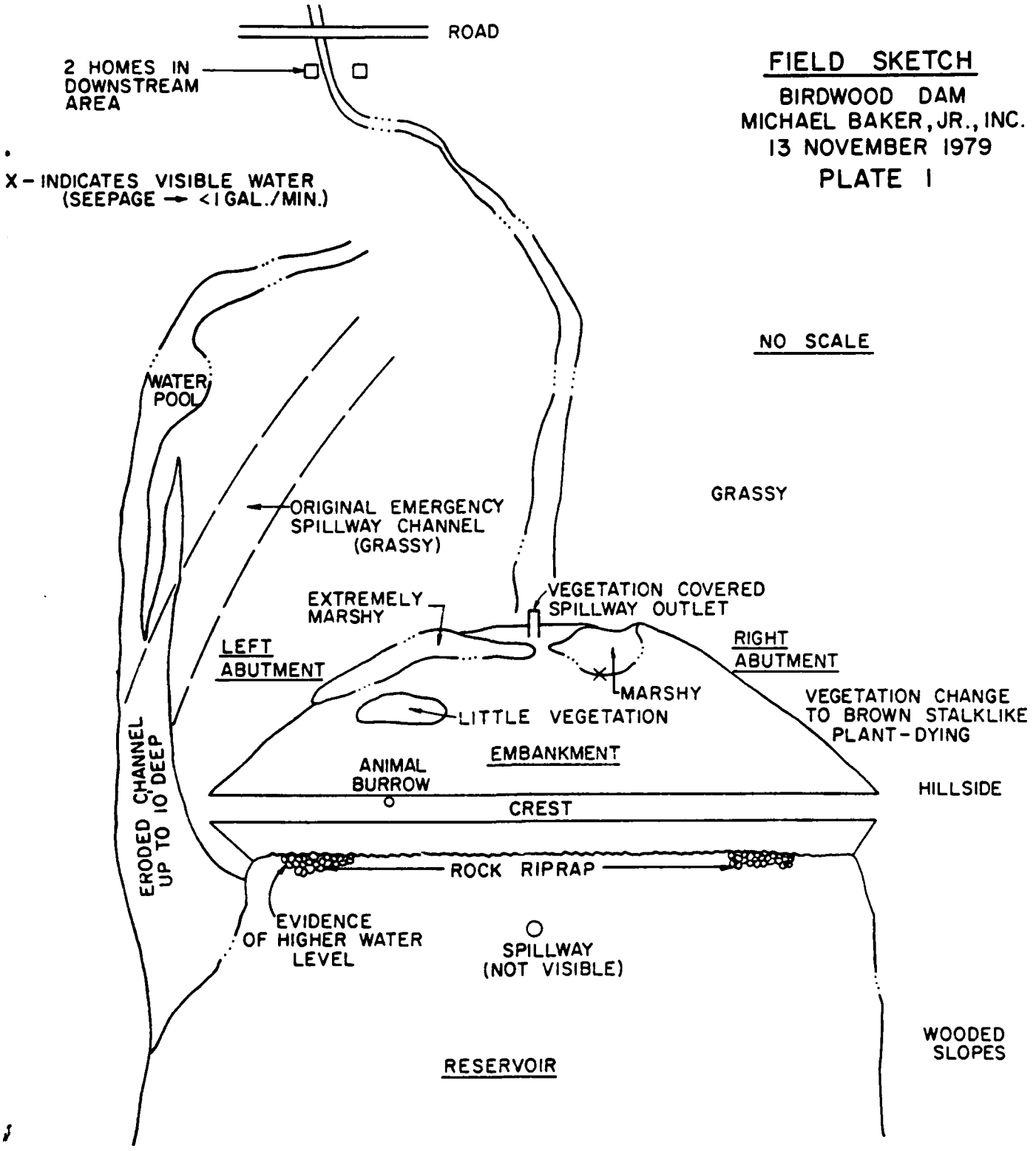
NAME OF DAM: BIRDWOOD DAM



BIRDWOOD DAM
LOCATION PLAN

FIELD SKETCH

BIRDWOOD DAM
MICHAEL BAKER, JR., INC.
13 NOVEMBER 1979
PLATE 1



NOTE:

UPSTREAM AND DOWNSTREAM EMBANKMENT, ABUTMENTS, CREST, AND DOWNSTREAM CHANNEL ARE VERY OVERGROWN.
DOWNSTREAM EMBANKMENT SURFACE SEEMED IRREGULAR - HOWEVER VEGETATION PREVENTED BETTER OBSERVATION.
NO KNOWN TOE DRAINS.

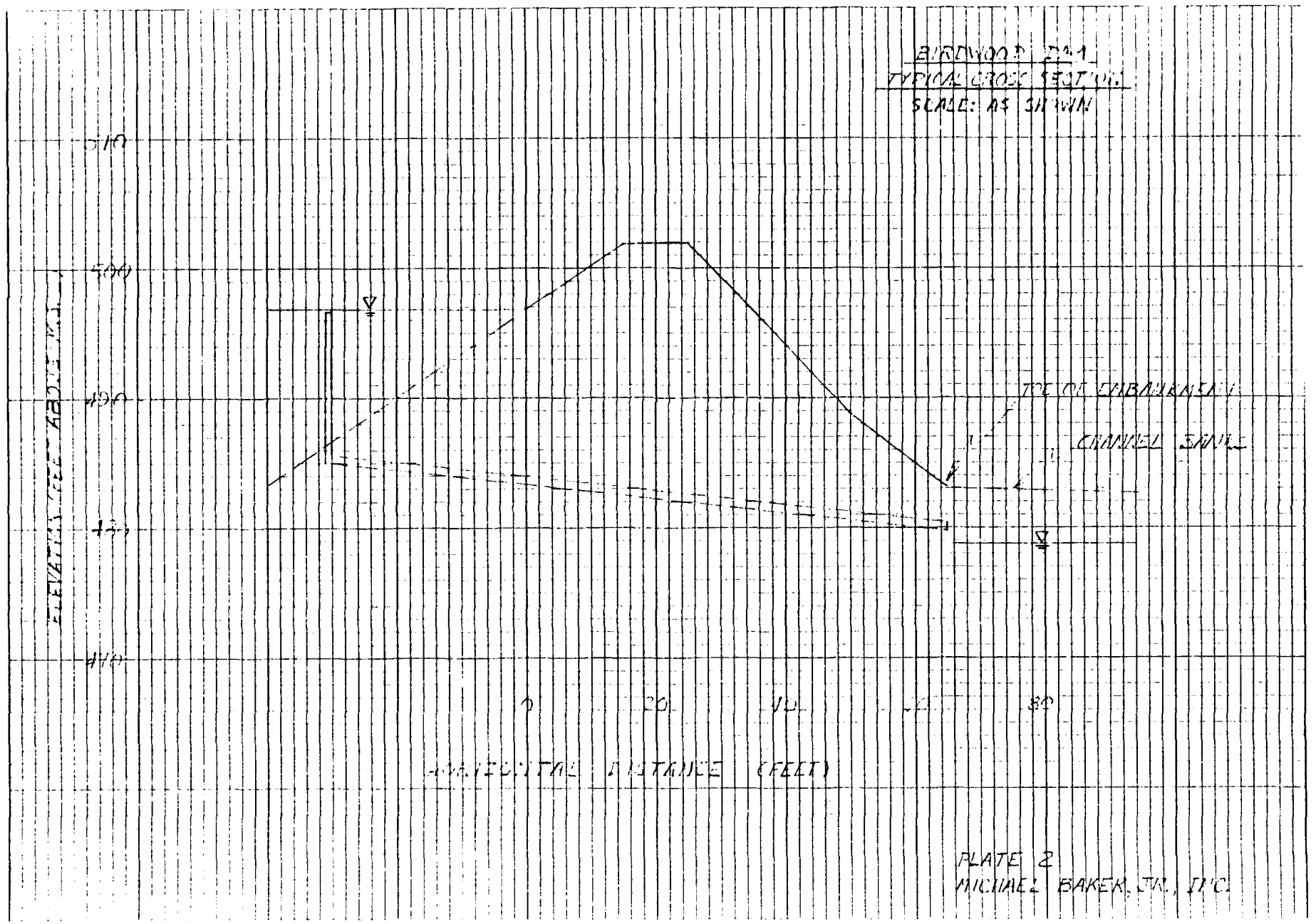


PLATE 2
MICHAEL BAKER, JR., INC.

BIRDWOOD DAM
TOP OF DAM PROFILE
SCALE: AS SHOWN

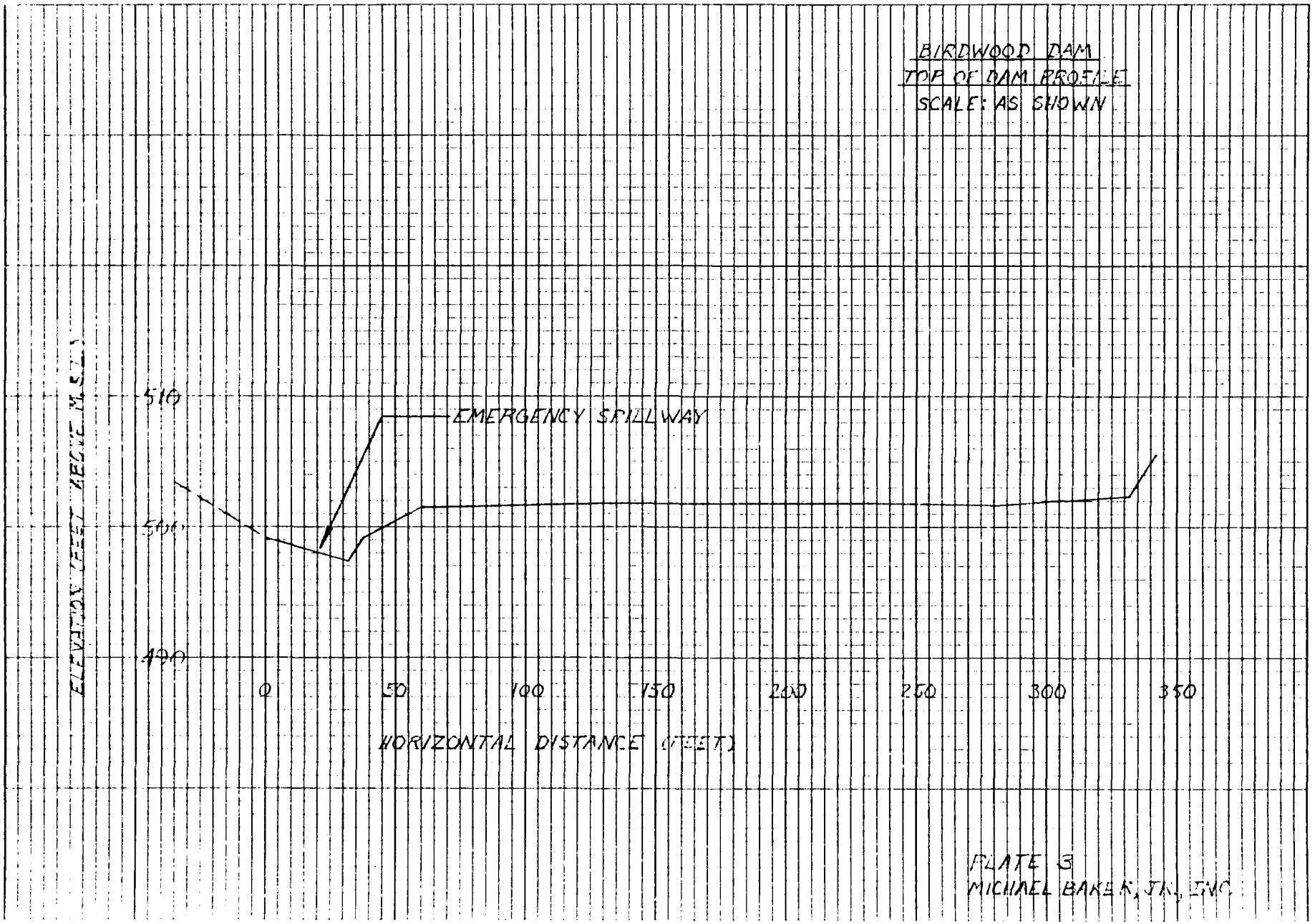


PLATE 3
MICHAEL BAKER, JR., INC.

APPENDIX II

PHOTOGRAPHS

CONTENTS

Note: Photographs were taken on 13 November 1979.

BIRDWOOD DAM

PHOTO 1. Looking Upstream at Erosion in Emergency Spillway

PHOTO 2. Upper End of Emergency Spillway

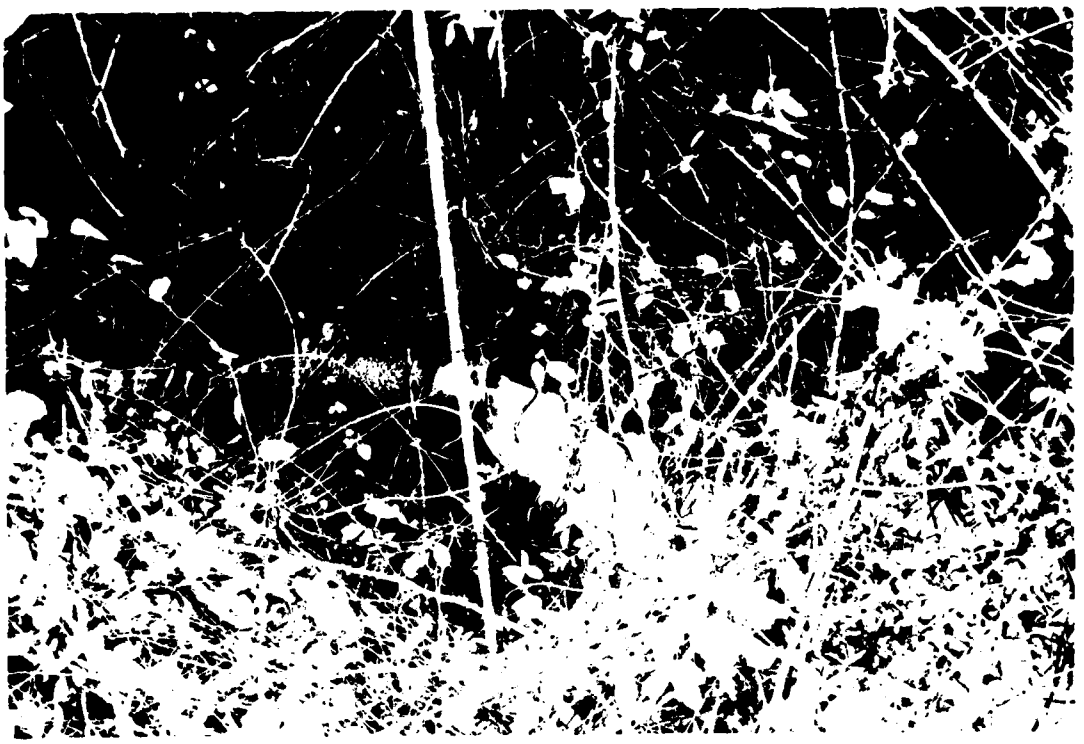


PHOTO 3. Six Inch Cast Iron Outlet Pipe; Water Seeping from Below Pipe

PHOTO 4. Damage Area - Home on Left Has Basement Garage

PHOTO 5. Marshy Area at Toe of Dam, Fifty Feet Left of Outlet Pipe

PHOTO 6. Seepage Area at Toe of Dam, Twenty Feet Left of Outlet Pipe

APPENDIX III

VISUAL INSPECTION CHECK LIST

Check List
Visual Inspection
Phase 1

Name of Dam Birdwood Dam County Albemarle State Virginia Coordinates Lat. 3803.8

Long. 7853.8

Date of Inspection 13 November 1979 Weather Rainy Temperature 45°F.

Pool Elevation at Time of Inspection 496.9 ft. M.S.L. Tailwater at Time of Inspection 478.8 ft. M.S.L.

Inspection Personnel:

Michael Baker, Jr., Inc.:	Virginia Water Control Board:	Owner's Representatives:
David J. Greenwood, P.E.	Leon Musselwhite	Larry Steward
Jeffrey A. Quay	David Bushman	William Tharpe
Leslie K. Black		

Leslie K. Black Recorder

EMBANKMENT

Name of Dam: BIRDWOOD DAM

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
SURFACE CRACKS	None visible	
UNUSUAL MOVEMENT OR CRACKING AT OR BEYOND THE TOE	There was no apparent moving or cracking. The toe area was, however, very marshy and overgrown.	Remove excess vegetation and reinspect. The extent and method of removal should be determined by a qualified professional consultant after a more detailed examination.
SLOUGHING OR EROSION OF EMBANKMENT AND ABUTMENT SLOPES	There is some sloughing apparent midway on the left side of the embankment. The entire embankment is damp. There was no visible erosion on the embankment or the abutments. The entire embankment was covered with excess vegetation consisting of trees and thick brush.	The downstream embankment surface seemed somewhat irregular; the thick vegetation prevented a better assessment. The thick vegetation on the embankment should be cleared and the embankment should be reinspected.
VERTICAL AND HORIZONTAL ALIGNMENT OF THE CREST	The horizontal and vertical alignments of the crest are good. The crest adjacent to the spillway is somewhat irregular. There are some small tire depressions and an animal burrow on the crest.	The depressions and the animal burrow should be filled and reseeded. The junction of the spillway/embankment should be reshaped when spillway improvements are made.
RIPRAP FAILURES	The upstream face of the dam is riprapped. The riprap appears in good condition; however, an erosion berm is forming because the normal pool level is very near the top of the riprap.	The erosion should be checked periodically and consideration should be given to lowering the normal pool or riprapping higher up the face.

EMBANKMENT

Name of Dam: BIRDWOOD DAM

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
JUNCTION OF EMBANKMENT AND ABUTMENT, SPILLWAY AND DAM	The left abutment is very swampy. As shown in photos, members of the inspection team sank about 1 - 1.5 ft. into mud all along the contact area and extending to a point about 10 ft. from the toe. Right abutment is damp but not marshy. The spillway/dam contact is eroded from a recent storm.	The left abutment area needs further observation and study to determine its effect on dam stability. The spillway contact needs to be reshaped and riprapped to prevent recurring erosion.
ANY NOTICEABLE SEEPAGE	Numerous locations are marshy and many show iron staining. There was noticeable seepage along the toe of the dam; flows were less than one gallon per minute each.	Marshy areas and seeps should be monitored at regular intervals and during high reservoir levels to check for turbidity and/or increase in flow.
STAFF GAGE AND RECORDER	None	A staff gage should be installed.
DRAINS	None observed	

OUTLET WORKS

Name of Dam: BIRDWOOD DAM

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CRACKING AND SPALLING OF CONCRETE SURFACES IN OUTLET CONDUIT	Not Applicable	
INTAKE STRUCTURE	The inlet was submerged during the field inspection. According to the owner it is a vertical 6 in. C.I.P. There was no observable trash rack to prevent clogging.	A trash rack should be installed and maintained regularly.
OUTLET STRUCTURE	The outlet is a 6 in. C.I.P. protruding from a concrete head wall. The pipe has several small holes in the bottom and is leaking.	
OUTLET CHANNEL	The outlet channel is enlarged due to high flows but is stable. The brush is overgrown on most of the channel area; however, the actual channel is clear.	Vegetation should be trimmed and the channel immediately downstream from the outlet pipe should be riprapped to prevent further erosion.
EMERGENCY GATE	None	There is no emergency drawdown facility.

UNGATED SPILLWAY

Name of Dam: BIRDWOOD DAM

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CONCRETE WEIR	Not Applicable	
APPROACH CHANNEL	The approach channel is very short and is severely eroded to bedrock. The shape is irregular due to recent storms. Some clean up work has been started in the spillway and therefore the full extent of erosion is not known.	The approach channel should be reshaped, riprapped, and/or reseeded to reduce the erosion problems in the future.
DISCHARGE CHANNEL	The discharge channel is severely eroded to bedrock. Because of recent storms the channel has moved from its intended path. The erosion scour is from 5-15 ft. deep downstream from the dam. Fortunately, near the dam the bedrock is close to the surface and has controlled the extent of erosion.	The erosion channels downstream should be regraded and reshaped and a new discharge channel location formed.
BRIDGE AND PIERS	Not Applicable	

INSTRUMENTATION

Name of Dam: BIRDWOOD DAM

VISUAL EXAMINATION	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
MONUMENTATION/SURVEYS	None recently completed	
OBSERVATION WELLS	None observed	
WEIRS	None observed	
PIEZOMETERS	None observed	
OTHER		

RESERVOIR

Name of Dam: BIRDWOOD DAM

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
SLOPES	The reservoir slopes are gradual and well vegetated. The watershed is primarily farmland around the pond; however, the upper portion is becoming highly developed.	
SEDIMENTATION	Reservoir sedimentation is minor because the farmland is generally not cultivated and 3 smaller ponds upstream apparently catch sediment from upstream developments.	

DOWNSTREAM CHANNEL

Name of Dam: BIRDWOOD DAM

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CONDITION (OBSTRUCTIONS, DEBRIS, ETC.)	The downstream channel is clear but has extensive erosion; channel banks are unstable.	
SLOPES	The downstream channel is steep immediately below the dam, with a slope of about 2.7%. The main stream where the damage area is located is about a 2% slope. Vegetation is thick adjacent to the channel but the overbanks are fairly clear. Vegetation consists of trees, saplings, and brush.	
APPROXIMATE NO. OF HOMES AND POPULATION	The downstream damage area contains two homes with an estimated population of 8.	

APPENDIX IV

CORRESPONDENCE

UNIVERSITY OF VIRGINIA
OFFICE OF UNIVERSITY PLANNING

MEMORANDUM

To: Mr. William Middleton

From: Waller S. Hunt, Jr.

Re: Inspection of Birdwood Dams

In your memorandum of 6 November 1979, you asked if I had any records relative to the dams at Birdwood.

I am acquainted with the gentlemen who apparently designed those dams and who overviewed their construction. Fortunately, he is living in Charlottesville, and while retired from the Federal Soil Conservation Office, can be reached for discussion. His name is R. O. Anderson, and lives on Oxford Road.

Mr. Anderson, upon graduating from Virginia Tech, took a job as farm manager at Birdwood in early 1930's. It was during his term on the farm that the dams were built. He took into account, according to my discussion with him, the then established water shed and designed the size of the flow pipes and the type of water retainaged facility desired. He has indicated that if we were to design those dams today, they would not have as steep an incline on the exposed side of the dam, would probably have a much larger overflow pipe and a large, grassed emergency spillway.

Probably the local Office of Soil Conservation will give you the same information. Mr. Coiner, of that office, is very aware of the design provisions for new dams and can certainly furnish any information you may need for repairs to the dam. I believe he recently looked at those dams and furnished some information to Bill Tharpe.

WSHjr:cvc

cc: Mr. H. I. Taylor

WASHINGTON HALL, CHARLOTTESVILLE, VIRGINIA 22903 (804) 924-3718

13114-18

RVG. Orig. BWCM
(Copy RVD)

UNIVERSITY OF VIRGINIA

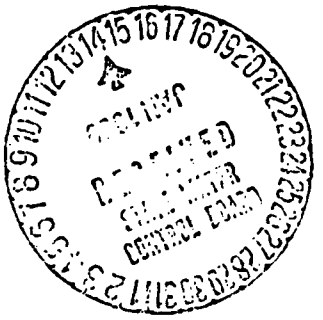
DEPARTMENT OF BUILDINGS AND GROUNDS

OFFICE OF THE DIRECTOR

UNIVERSITY OF VIRGINIA
CHARLOTTESVILLE, VIRGINIA 22903

January 10, 1980

cc: DSG



Mr. R. V. Davis
Executive Secretary
Commonwealth of Virginia
State Water Control Board
2111 Hamilton Street
Richmond, Virginia 23230

Dear Mr. Davis:

This will acknowledge your letter of December 28, 1979, concerning the unsafe condition of the Birdwood Dam, as determined by the firm of Michael Baker, Jr. Inc. in an inspection conducted on November 13, 1979, under contract to the Norfolk District, U.S. Army Corps of Engineers under the National Dam Safety Program.

Please be advised that we have taken action to drain this lake, with a contractor starting work this date and expected to complete the work within 4 to 5 days. Pending receipt of the Phase I Inspection Report and completion of recommended corrective measures, the lake will remain drained.

William D. Middleton
Director

cc: George L. Jones, State Office of Emergency and Energy Services
Linda Peacock, Office of Emergency and Energy Services
J. G. Starr, Norfolk District Corps of Engineers

APPENDIX V

GENERAL REFERENCES

GENERAL REFERENCES

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